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(54) Title: IMPROVEMENTS RELATING TO HEAT RETAINING MATERIALS

(57) Abstract

A heat retaining material comprises a mixture of about 20 to 35 % by weight of a triglyceride or a substitute therefor, incorporating an admixture of powdered minerals having a heat storage capability, or a mixture of 40 % to 90 % by weight of ethylene propylene rubber or thermoplastic polymer or elastomer or styrene based thermoplastic elastomers with the balance of the mixture being an inert filler material having heat storage capabilities, thus creating a mixture having malleable clay-like qualities, all the ingredients being substantially moisture free. This type of material is ideally suited for forming body warming devices and is particularly advantageous in that it can be heated in an oven such as a microwave oven.

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"Improvements relating to heat retaining materials"

The objective of this invention is to provide a heat retaining material which can be used safely as part of a body warmer, and which can be heated readily, such as in a microwave heater. Liquid mixtures have been proposed for this purpose, but they do have the inherent risk that, if the enclosing cover should rupture, the body of the user could be exposed to direct contact with a very hot liquid.

According to one aspect of this invention, there is provided a heat retaining material comprising a mixture of about 20 to 35% by weight of a triglyceride or a substitute therefor, incorporating an admixture of powdered minerals having a heat storage capability, or a mixture of 40% to 90% by weight of ethylene propylene rubber or thermoplastic polymer or elastomer or styrene based thermoplastic elastomers with the balance of the mixture being an inert filler material having heat storage capabilities, thus creating a mixture having malleable clay-like qualities, all the ingredients being substantially moisture free,

The powdered minerals will ideally comprise a mixture of barytes and a bulking agent in proportions by weight expressed as a percentage of the total weight of the material of 10 to 50%, preferably 25 to 40% of the barytes and 30 to 55%, preferably 40 to 45%, of the bulking agent. The bulking agent may talc, exfoliated vermiculate, hollow alumino silicate spheres, zinc oxide, or any combination thereof, having a mesh size of 50 to 400, preferably 100 to

250. Preferably, however, the bulking agent is or includes sepiolite, molar earth or diatomaceous earth having a mesh size of 50 to 250 perferably 60 to 120. The barytes can be of 5 to 40 mil grade, but preferably of 15 to 25 mil grade.

The triglyceride or substitute therefor can comprise glycerol, a mineral or vegetable oil, a synthetic hydrocarbon oil, a petro-oil or silicone oil.

The material will advantageously include up to 15%, preferably 5 to 10% by weight of dicalyte, pearlite or other thickening agent. 1 to 2% by weight of an organo flilic clay having a mesh size of 50 to 400, preferably 150 to 250, may also be incorporated as a viscosity binder.

In a preferred form of material, the constituents mixed in with the triglyceride or substitute therefor comprise an admixture of 40% to 90% by weight of the ethylene propylene rubber (EPR) or other elastomeric material together with 1 to 20% of barytes, filite or talc and 5 to 40% of a lighter weight inert filler material which may itself be filite.

The mixture will vary from application to application but 70% ethylene propylene rubber, 10% barytes, 10% filite, 10% vermiculite or alternative is a good general mix. In place of vermiculite as a preferred filler, perlite, whiting, calcium carbonate, chalk or talc for example could be used.

More particularly the material will ideally comprise, for every 10 parts of the rubber or elastomer, 10 to 30 parts of proc ssed oil and 10 to 30 parts of the mixture of barytes and other fillers. In such a material about 20

parts of the processed oil and 20 to 30 parts of the fillers is preferred, for every 10 parts of the rubber or elastomer.

The softness (sponginess) is increased by increasing the amount of processed oil added to the EPR mix. An aerating agent can be added to increase lightness of the product. A de-odourising compound can be added to the mix, to mask the rubber smell. Pleasant, soothing essential oils could be added to the mix which could aid sleeping.

For a heat pad, ideally a thinner area of the product has to be created, that will cool down more rapidly, to allow ease of handling. Various lifting tabs or handles could be pushed on or added after moulding. Instructions can be moulded onto the pad (or any of the other products made) and even braille can be etched on.

Slabs of the mixture can be made, so that products and shapes can be cut or stamped out of the sheets. Lightweight storage heaters could be created in which slabs, preheated in a microwave or other oven, could be slipped in, so that heat could be given out, without the need to have any electricity connected to the heaters which would provide safe heat, ideal for children's bedrooms. Cold retaining units could be manufactured so that the blocks could be first placed in a freezer and then into the retaining units in a room, or car for example. Ideally these blocks of the mixture should be of a size to fit in a microwave oven.

Outer retaining units, such as heat pad outer covers, should keep in a certain amount of heat, or cold and gradually disperse either the heat or cold over a period of

time. The retaining units could possibly be made of vented polystyrene foam or the like. The vents in a storage unit or air cooling unit would allow either the hot air to escape upwards (circulated by the draught from the bottom vents) or the cold air to escape downwards (circulated by the draught from the top vents).

When EPR or an alternative is mixed, by adding barytes, filite, vermiculite (or some other filler), then solid blocks can be formed such that (when curing has occurred) have very useful heat retention and dispersion qualities. This "mixture" can be moulded, under pressure or by injection moulding, to any shape for example heat pads, toy shapes, cups, shoes insoles, and glove shapes. For body joint injuries or aches, then "joint" shapes could be moulded to clip around the joints and these could be heated up, or cooled down to relieve the pain.

Because the mix has good cold-retention properties then countless applications especially cool bags and boxes and air conditioning could be found.

It is known that golf balls travel further when hot so a special hot pad with a removable lid could be made to last a trip around a golf course. The whole product, including golf balls, could be placed in an oven. Ideally a temperature indication strip should be moulded into the product to show that the correct temperature has been reached.

Another possibility is to mould the material into a barrel shape, similar to that of conventional hair rollers, with or without prongs, to be used for heated hair curling.

They could be shaped to fit onto curling tongs.

Heat/temperature indication strips can be placed or moulded into any of the products using the "mix". A rope-like electrical element or an element capable of working in dense materials could be placed or moulded into the mix so that this electrical element (say 75 to 150 watts) would heat up when connected to a power supply to pre-heat the block of material.

It is much preferred that all the ingredients used should be substantially inert and harmless if ingested by humans. An electrical heating element could, if desired, be distributed throughout the heat retaining material, to provide the means for heating the mixture.

The invention further extends to a body warmer comprising a quantity of the heat retaining material of this invention as hereinbefore defined enclosed within a sealed flexible pouch.

Preferably the pouch is formed from a material whose physical characteristics will not be harmed by microwave heating. Ideally also the pouch will be held within a removable fabric cover having flame retardant qualities. The fabric cover may have a large tongue to fold into the cover and over the whole of one side of the pouch.

Ethylene propylene rubber (EPR) could advantageously be used to make the retaining pouch similar to a hot water bottle shape, or be used as a basis for a filling material. EPR does not readily break down under microwave heating (or oven heating, or freezing) unlike natural rubber. Other

silicones or thermoplastic polymers or elastomers or styrene based thermoplastic elastomers could be used, but they are generally more expensive. If a pouch is made of EPR, the filling point must have no metal or part metal stopper, if it is to be used in a microwave oven.

The invention may be performed in various ways and preferred examples thereof will now be described.

The following table 1 gives details of sample mixtures which have been prepared using the mixture of ingredients of this invention to create a heat retaining material. The mixtures prepared were constructed for their heat retaining properties and general acceptability and were given a rating up to 10. It will be noted that the example using barytes in a dual capacity (to act also as a filler) resulted in a mixture having a poor rating.

TABLE 1

Ingredients	Examples (Parts by Weight)						
	1	2	3	4	5	6	7
Glycerol	250	200	150	300	135	300	240
Barytes	750	350	400	100	100	200	100
Sepiolite		350		300	100	200	200
Talc			230	200	100	200	200
Pearlite							50
Smectite Clay							10
Rating	1	6	7	7	8	9	10

The relationship between the materials used for the mixtures are indicated in terms of percentage parts by weight (in approximate terms) in the following Table 2.

TABLE 2

Example	% parts by weight		
	Glycerol	Barytes	Filler
1	25	75	-
2	20	40	40
3	30	25	45
4	35	10	55
5	20	50	30
6	35	25	45
7	35	15	55

In the most successful example (Example 7) it will be seen that there is a fairly substantial proportion of filler divided equally between talc and sepiolite. Of the additional ingredients the pearlite (or dicalyte) has the effect of acting as a thickener and also has some heat retention properties. Pearlite is an expanded amorphous siliceous rock of volcanic origin incorporating sodium potassium and aluminium silicates of variable composition. The smectite clay (or organo flilic clay) is present in a small quantity and has a powder size of 200 mesh and promotes good viscosity whilst also acting as a binder and helps to extend the life of the mixture. In this example

the barytes is chosen to have 17 mil grade. The sepiolite (or molar earth) is a powder of mesh size between 60 and 120 whilst the talc is a powder of 200 mesh size.

The various components of the mixture act to absorb the glycerol which acts as a binder and a heat transfer medium. The mixture will be substantially moisture free (so that gas bubbles will not generally be formed during heating) but a moisture content up to 5% could be acceptable.

The sepiolite provides for good heat retention (together with the glycerol and the barytes), and promotes a well controlled heat dissipation. The talc (or other suitable filler material) also provides good heat retaining and insulation properties.

The invention will now be described further, and by way of example, with reference to the accompanying drawings, in which:-

Figure 1 illustrates one form of a body warmer constructed in accordance with this invention; and

Figure 2 illustrates an alternative embodiment of a cushion-like body warmer of the invention.

As shown in Figure 1, a sealed flexible body 1 of a plastics material acts as a pouch to incorporate a heat retaining mixture as defined in one of Examples 2 to 7 above. The pouch 1 can be slid into a quilted fabric cover 2 which has a large tongue 3 which can be folded into the cover and over the whole of one side of the pouch 1 so that accidental contact with the surface of the pouch 1 will be avoided if a hand or foot is inserted into the cover 2. It

is proposed that the pouch 1 will be heated by subjection to microwaves in a microwave heater. The pouch can be retained within the cover 2 whilst such heating is taking place. Alternatively a heating element can be distributed throughout the material within the pouch 1, as illustrated by dashed lines 10. This can then be connected to an electrical supply by a plug 11 to heat up the material.

Figure 2 shows a body warmer in the form of a padded cushion constructed from a material which defines a pair of pockets 4 joined by part of the material forming a hinged strip 5. At one end of each pocket there is an opening 6 with a releasable sealing arrangement. This enables sealed flexible pouches 7 to be slid in and out of each pocket. These pouches 7 are of the type as described in detail in my co-pending patent application No. 9005091 and which contain a heat-retaining clay-like material.

In use the pouches 7 will be heated (such as by using a microwave heater) and slid into the pockets 4. (Alternatively the whole unit could be subjected to heating if the material defining the pockets 4 will not be degraded by heating). The cushion will then provide a warm seat for anyone sitting on it and this would be invaluable for use at sports grounds in cold weather.

In order to provide for ease of carrying, straps 8 are attached to the article and are held in place by loops 9 which are stitched in place. During carrying the two padded parts will fold against one another about the hinge 5 to provide a mor compact arrangement. The underside of the

article could be coloured white or covered with a reflective foil which will minimise heat loss through the lower surface. The upper surface of the material will preferably have stitching lines across it, which aids the controlled release of heat (through the stitching holes) from the pouches. The material forming the pockets 4 could be a woven polypropylene or polyethylene. Laminated materials which would trap foam or bubbles would be advantageous in order to limit excessive heat loss and to make the article more comfortable to sit on.

CLAIMS

1. A heat retaining material comprising a mixture of about 20 to 35% by weight of a triglyceride or a substitute therefor, incorporating an admixture of powdered minerals having a heat storage capability, or a mixture of 40% to 90% by weight of ethylene propylene rubber or thermoplastic polymer or elastomer or styrene based thermoplastic elastomers with the balance of the mixture being an inert filler material having heat storage capabilities, thus creating a mixture having malleable clay-like qualities, all the ingredients being substantially moisture free.

2. A material according to claim 1, wherein the powdered minerals comprise a mixture of barytes and a bulking agent in proportions by weight expressed as a percentage of the total weight of the material of 10% to 50%, preferably 25% to 40% of the barytes and 30% to 55%, preferably 40% to 45% of the bulking agent, the bulking agent preferably being alone or in combination talc, exfoliated vermiculate, hollow alumino silicate spheres, zinc oxide, or any combination thereof, having a mesh size of 50 to 400, preferably 100 to 250, or sepiolite, molar earth or diatomaceous earth having a mesh size of 50 to 250 preferably 60 to 120, the barytes, when present ideally being of 5 to 40 mil grade, preferably 15 to 25 mil grade.

3. A material according to claim 1, wherein the constituents mixed in with the triglyceride or substitute therefor comprise an admixture of 40% to 90% by weight of

the ethylene propylene rubber (EPR) or other elastomeric material together with 1 to 20% of barytes, filite or talc and 5 to 40% of a lighter weight inert filler material which may itself be filite, preferably in the ratios of 70% ethylene propylene rubber, 10% barytes, 10% filite, 10% vermiculite or another filler, such as perlite, whiting, calcium carbonate, chalk or talc.

4. A material according to claim 3, wherein for every 10 parts of the rubber or elastomer, 10 to 30, preferably 20 to 30 parts of processed oil and 10 to 30 preferably 20 to 30 parts of the mixture of barytes and other fillers.are provided

5. A material according to any one of Claims 1 to 4, wherein the triglyceride or substitute therefor comprises glycerol, a mineral or vegetable oil, a synthetic hydrocarbon oil, a petro-oil or silicone oil.

6. A material according to any one of Claims 1 to 5 including up to 15%, preferably 5 to 10% by weight of dicalyte, pearlite or other thickening agent, and/or 1% to 2% by weight of an organo flilic clay having a mesh size of 50 to 400, preferably 150 to 250, as a viscosity binder.

7. A material according to any one of Claims 1 to 6 including an electrical heating element distributed throughout the heat retaining material.

8. A body warmer comprising a quantity of the heat retaining material as defined in any one of Claims 1 to 7, enclosed within a sealed flexible pouch, preferably formed from a material whose physical characteristics will not be

harmed by microwave heating, and ideally held within a removable fabric cover having flame retardant qualities.

9. A body warmer according to Claim 8, wherein the fabric cover has a large tongue to fold into the cover and over the whole of one side of the pouch.

10. Any novel combination of features of a heat retaining material on a body warmer as described herein and/or as illustrated in the accompanying drawings.

FIG.1

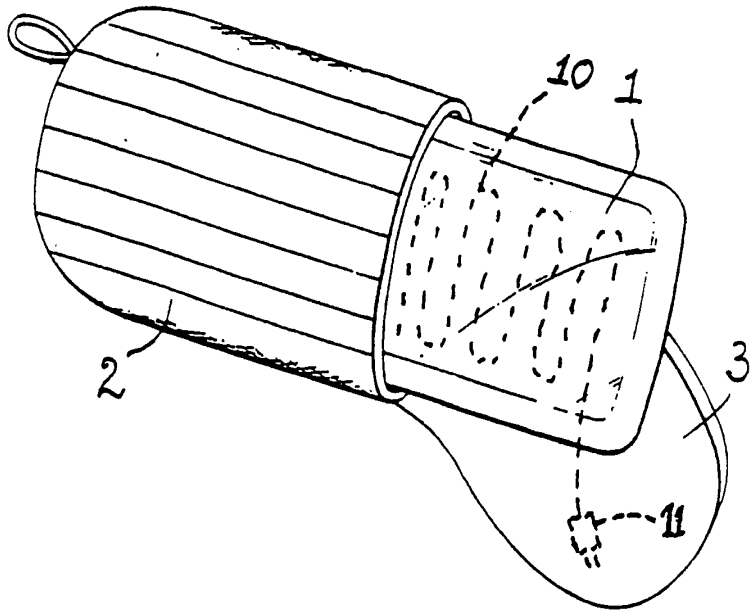

FIG.2